ABSTRACT

The present invention provides for smaller, faster Reed-Solomon encoders, while at the same time providing support of multiple codes in a simple architecture having a reduced number of Galois field multipliers. In accordance with the principles of the present invention, a polynomial is factored differently than conventional Reed-Solomon encoders, resulting in enhanced performance, simplified circuitry, and/or a reduction of critical paths in the Reed-Solomon encoders. Thus, not only are the number of required Galois field multipliers reduced, but support for three different Reed-Solomon codes is provided with a minimized number of Galois field multipliers. In the disclosed embodiments, rather than implementing *n* subfilters each representing an individual degree polynomial filter as in Cox's conventional Reed-Solomon encoder, the present invention implements multiple degree polynomials factored in a way which is convenient to a desired plurality of Reed-Solomon codes. The polynomials may be divided into any degree subtrunks convenient for the particular application. One preferred embodiment supports up to three Reed-Solomon codes all within a single architecture, comprising only three cascaded filters. Each of the individual filters balances and reduces critical path lengths in the Reed-Solomon encoder, and reduces the loading of critical nets, resulting in a Reed-Solomon encoder with a greater throughput for a given technology. For instance, the conventional Cox taught Reed-Solomon encoder would require, e.g., 24 subfilters to provide *n* bytes of redundancy, each subfilter having polynomial having a single degree. However, in accordance with the principles of the present invention, three different Reed-Solomon codes may be provided (e.g., 14 bytes of redundancy, 22 bytes of redundancy, or 24 bytes of redundancy), by cascading three multiple degree polynomial subfilters (e.g., a first subfilter of degree 14, a second subfilter of degree 8, and a third subfilter of degree 2).